

IVS General Meeting Proceedings Template and LaTeX Examples

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Abstract

This document demonstrates LaTeX examples and provides general guidelines for creating a submission to the Proceedings of the IVS 2012 General Meeting. This document's source (tex) file may be used as a rough template for a submission.

To use this document for guidelines and examples, read section 1 for LaTeX examples and hints, referring to the tex file for more detailed explanations. Section 1 is geared towards authors who do not have time to learn LaTeX in detail and need a quick guide. IVS authors with advanced LaTeX skills will already know the information in section 1, but the IVS Coordinating Center requests that advanced authors please look at the examples and follow them, even if more advanced LaTeX techniques are available. Advanced, non-standard techniques (especially ones requiring user-defined commands) may cause processing problems, including style discrepancies which must be resolved before publication. All authors are also strongly requested to please read section 2 for some caveats and for some requests from the Coordinating Center for the use of LaTeX techniques that will let the Coordinating Center produce the General Meeting Proceedings more efficiently while retaining as much as possible the authors' desired formats for tables and figures.

To use the tex file as a template, read the comments (lines starting with %) in the header, abstract and bibliography, then substitute values for your paper. Then substitute the body of your paper for the sections between the abstract and the bibliography.

1. LaTeX Examples and Guidelines

This section shows examples of LaTeX commands and environments and gives guidelines for using LaTeX. General guidelines are given as text and will appear in the output of this document. Explanations of individual commands are given as comments in the tex file and will not be visible in the output. The examples in section 1 are a combination of real and modified examples from the IVS 2000 Annual Report and fictional examples.

1.1. Figures and Tables

LaTeX's positioning of figures and tables can be complicated. Authors can suggest where they want a figure or table to be placed, but LaTeX will choose the final location based on its internal rules for the best arrangement of figures, tables and text. The best approach is to finalize the text, then experiment with the figures and tables by moving the .tex source lines specifying the figures and tables to different points, by using different location arguments for the `\begin{figure}` and `\begin{table}` environments and by resizing and clipping (cropping) the figures. One or more of the following location arguments must be placed in brackets ([]) in the `\begin{figure}[]` and `\begin{table}[]` environments:

- `h` - tries to put the figure or table “Here” (at the place in the text where the environment is specified)

- `t` - tries to put the figure/table at the **T**op of a page
- `b` - tries to put it at the **B**ottom of a page
- `p` - tries to put it on a page containing only figures and tables
- `!` - makes extra effort to place the figure/table as early as possible in the document (as allowed by the other arguments and by the general LaTeX rules)

The LaTeX User's Guide and Reference Manual [12] gives a full explanation of how multiple arguments interact. Also see the comments and examples in this document's tex file.

1.1.1. Figures

Unlike previous General Meeting Proceedings, the 2012 Proceedings will be compiled using the `pdflatex` command (which will omit the `dvi` step in the processing chain directly impacting the handling of image files). `pdflatex` natively supports the JPG, PNG, and PDF graphics formats. It, however, does not directly accept PostScript (PS) or Encapsulated PostScript (EPS) files. An easy workaround for the lack of PS/EPS support is to convert the PS or EPS file to PDF format using the `ps2pdf` utility or equivalent. PDF supports vector and raster formats; but the raster version produces significantly larger files than the equivalent PNG or JPG files. Hence, for bitmap representations PNG and JPG are the recommended formats. JPG is a raster format widely used for photos (with possible compression loss); PNG is a lossless raster format best used for diagrams, screenshots, and the like. Note that the support of the TIFF format was discontinued with newer versions of `pdflatex`; for lossless bitmaps the preferred format is PNG. A general description of how to include graphics with `pdflatex` is, for instance, compiled at the URL http://en.wikibooks.org/wiki/LaTeX/Importing_Graphics.

The recommended command for inserting figures into a paper is the `\includegraphics` command. The syntax of the command allows for resizing, clipping (cropping), and rotating of the image. Figure 1 demonstrates the usage including sizing.

Figure 2, from the IEEC Technology Development Center's report [11], demonstrates the command, including clipping (cropping) and sizing. For usage with `pdflatex` the original encapsulated PostScript image file was converted to PDF using the `ps2pdf` utility on a Unix platform.

Two figures may be placed side-by-side using two minipage environments to position the figures, as shown in figures 3 and 4. A variation, figure 5, treats the figures as sub-figures. Text may also be placed beside a picture as shown in figure 6, a figure from the Svetloe Network Station report [8].

1.1.2. Tables

For the 2012 Proceedings, it is not planned to prepare an HTML Web version but rather a PDF online version only. Hence, subtle differences between HTML tables created from LaTeX code and their PDF counterparts are of minor concern. However, to maintain backward compatibility with the `ivs2e.cls` class file and the Annual Report formatting (which keeps the HTML Web version produced with the `latex2html` utility), the following description retains the references to the `latex2html` utility. The general instructions for the creation of tables in LaTeX, of course, continue to be valid.

Table 1 shows the only table format that translates accurately into HTML and the Web version



Figure 1. Use of includegraphics command (GGAO 12-m Radiotelescope).

of the Proceedings. Latex2html, the utility used to prepare the Web version, adds horizontal and vertical lines to all table entries, and it treats some blank areas as three-dimensional, so the other tables will be modified. Some of the modifications can be minimized by creating LaTeX-only and HTML-only portions of the tables (particularly, portions that need to suppress horizontal lines), as described in sub-section 1.6 and demonstrated later in this section. Still, only table 1 will look the same in both the printed and web versions of a paper. On the other hand, table 1 will not visually group data as well as the other examples will in the published version of the Proceedings. Authors should read section 2 to decide which table types to use.

Table 1. HTML Compatible Table

IVS Component Type	Number in 2000
Analysis Centers	20
Correlators	6
Network Stations	30
Operation Centers	3

Table 2 from the Fortaleza Network Station report [6] shows a table with horizontal lines but no vertical lines. Table 3 is part of a table from the HartRAO Network Station report [7]. This table shows another format which uses vertical lines and occasional horizontal lines to section off related data.

Table 4 (from the CORE Operation Center report [9]) demonstrates blank fields (in the line starting 1-Jan-2001) and columns with a specified width. If the data in a field will not fit within the column width, the table entry is automatically expanded vertically and the line wraps around. (Note the line starting with 1-Feb-2000.)

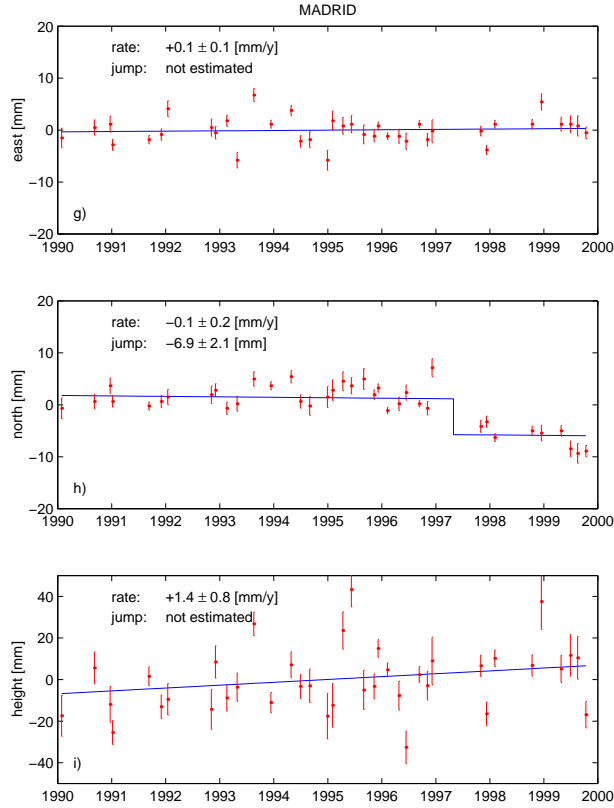


Figure 2. Use of the includegraphics command (including clipping and resizing) (Time Series of Topocentric Site Movements for Robledo), [11].

Table 2. Number of Geodetic VLBI Sessions in which Fortaleza has Observed, [6]

Experiment	Number of Sessions
NEOS-A	91
IRIS-S	19
CORE-B	08
CORE-OHIG1	04
CRF	01

Table 5, part of a table from the Shanghai Observatory Analysis Center’s report [2], demonstrates techniques for redefining the number of fields in a specific line. This is a useful formatting tool. For example, in table 5, redefining three of the header line’s middle fields as one field lets the two word heading “Angular velocity” be centered nicely over the latitude, longitude and ω columns. Table 6, part of a table from the IVS Analysis Coordinator’s report [5], shows a similar example to the Shanghai Observatory Analysis Center’s table, but the Coordinator’s table includes vertical lines by placing |’s in the tabular environment.

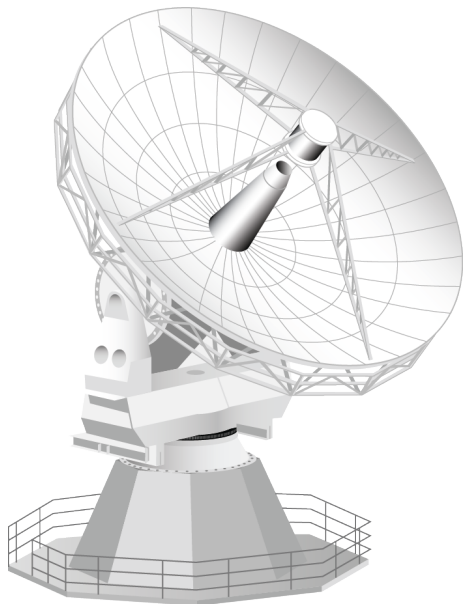


Figure 3. Side-by-side figure (Artist's rendition of a VLBI2010-type antenna, upright).

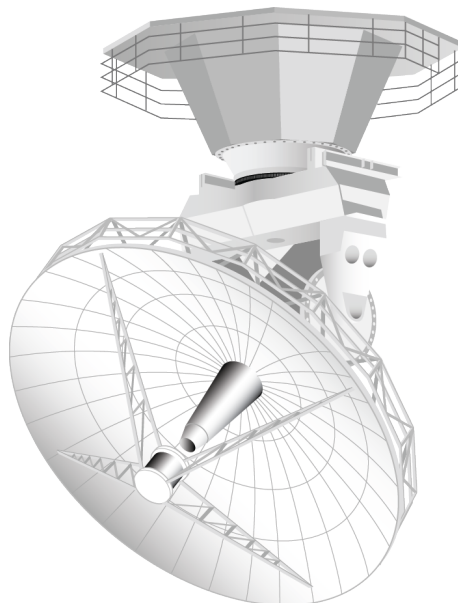
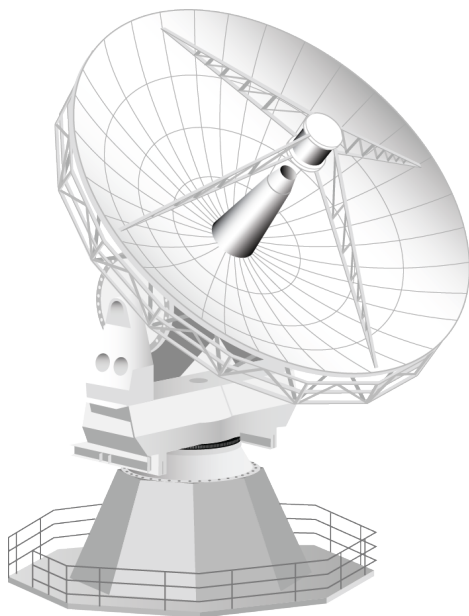
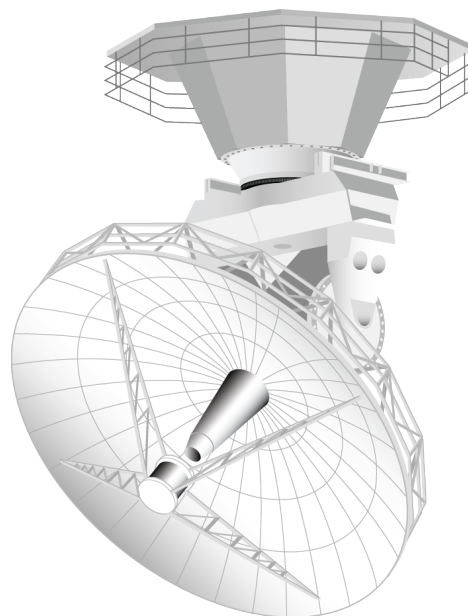


Figure 4. Side-by-side figure (Artist's rendition of a VLBI2010-type antenna, downside up).



Artist's rendition of a VLBI2010-type antenna, upright.

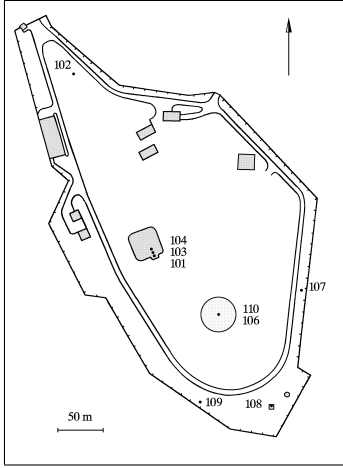


Artist's rendition of a VLBI2010-type antenna, downside up.

Figure 5. Use of sub-figures.

1.2. Lists and Other Formatting

The following embedded lists (which list part of a Solve batch control file's syntax) demonstrate how to form lists preceded by a large dot (`\itemize`), numbers (`\enumerate`) or arbitrary text in



Local geodetic network at the Svetloe observatory includes 9 reference points. 102, 107, 108, 109 are ground marks (the latter connected with a pad for mobile systems), 101, 103, 104 are located at the roof of two story laboratory building and designed for installation of GPS/GLONASS receivers or conventional geodetic units, 110 is the intersection of radiotelescope RTF-32 axis, and 106 is intermediate mark on its foundation. GPS receiver Trimble 4000SST is permanently installed on the 101 mark (12350M001, SVTL).

Figure 6. Figure and adjacent text, [8]

Table 3. Partial list of technical parameters of the radio telescope of HartRAO for geodetic VLBI, [7].

Parameter	HartRAO-VLBI
X-band (standard $\nu = 8.580GHz$, $\lambda = 0.0349m$)	$8.180 - 8.980 GHz$
T_{sys}	$65 K$
S_{SEFD}	$1500 Jy$
Point source	$17.1 Jy/K$
3 dB beamwidth	0.092°

Table 4. Planned CORE Evolution, [9]

Start Date	Experiment Name	Avg Days per Week	Notes
1-Feb-2000	CORE-A monthly	2.0	Mark IV Correlator efficiency < Mark III Correlator
1-Jul-2000	CORE-3 monthly	2.0	Discontinued CORE-A
1-Jan-2001	CORE-1 monthly	2.4	

bold type (\description):

1. \$SETUP section

- SOLUTION keyword
 - FORWARD** forward pass only (creates CGM)
 - BACK** back pass only (uses CGM for solution)
 - COMPLETE** forward, then back pass
- CGM keyword

Table 5. Angular motion between Eurasia and North America plates, [2]

(This table is based on a table from the Shanghai Observatory Analysis Center report)

Author	Technique	Angular velocity			Pole error ellipse		
		Latitude °N	Longitude °E	ω °/Myr	σ_{max} °	σ_{min} °	A N°E
DeMets et al., 1994	NUVEL1A	62.4	135.8	0.21 ± 0.01	4.1	1.3	-11
Cook et al., 1986	Earthquake	71.2	132.0				
Argus & Heflin, 1995	GPS	78.5	122.0	0.23 ± 0.03	4.1	2.4	-8

σ_{max} , σ_{min} : major and minor semiaxes of the 1σ error ellipse.

Table 6. Current average statistics, [5]

	x_p		y_p		$UT1 - UTC$		$d\psi \sin \epsilon_0$		$d\epsilon$	
	bias [μas]	wrms [μas]	bias [μas]	wrms [μas]	bias [μs]	wrms [μs]	bias [μas]	wrms [μas]	bias [μas]	wrms [μas]
BKG	-109	56	20	62	18	3	-26	43	-1	36
IAA	87	77	-133	75	-6	3	-8	51	-9	44
SPBU	42	73	-147	72	-15	3	28	47	-3	37

- ARC_FILES keyword

2. \$FLAGS section
3. \$OUTPUT section

A centered line is done via the center environment:

Example of a centered line

The remaining part of this sub-section is an example from the Paris Observatory Data Center's report [4]. It uses the `\verbatim` environment, which preserves the positioning of the input text (but produces a non-proportioned “typewriter” font).

```
ivscontrol/      : provides the control files needed by the data center
                  (session code, station code, solution code...)
ivsdata/         : provides files related to the observations:
  aux/           :  auxilliary files (schedule, log...)
  db/            :  observation files in data-base CALC format
  ngs/           :  observation files in NGS format
  sinex/         :  observation files in SINEX format
```

1.3. Equations and In-line Math

The IVS 2000 Annual Report submissions of the Analysis Coordinator [5], the Shanghai Observatory Analysis Center [2] and the Matera CGS VLBI Analysis Center [1] show excellent examples of equations and in-line math, and readers should compare these reports' tex files (available on the

IVS web site, as described in section 3) to the output reports in the paper copy of the IVS 2000 Annual Report. Two sample equations are included here.

The first equation is from the Analysis Coordinator's Report [5], and the second is from the Shanghai Observatory Analysis Center's Report [2]. Note that LaTeX has the ability to number equations in order, in parentheses at the right margin. The `\displaymath` and `\equation` environments respectively suppress and produce numbering for individual equations.

$$wrm s_{i,d\psi \sin \epsilon_0} = \sqrt{\frac{\sum_{j=1}^m p'_{d\psi_{ij} \sin \epsilon_0} (v_{d\psi_{ij}} - bias_{i,d\psi \sin \epsilon_0})^2}{\sum_{j=1}^m p'_{d\psi_{ij}}}}$$

$$\begin{pmatrix} v_x \\ v_y \\ v_z \end{pmatrix}_{NNR-NUVEL1A} - \begin{pmatrix} v_x \\ v_y \\ v_z \end{pmatrix}_{VLBI} = \begin{pmatrix} T_1 \\ T_2 \\ T_3 \end{pmatrix} + \begin{pmatrix} D & R_3 & -R_2 \\ -R_3 & D & R_1 \\ R_2 & -R_1 & D \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix}_{VLBI} \quad (1)$$

1.4. References, Citations and Footnotes

References provide an easy way to identify figures in a paper's text without referring to the figures' titles or explicitly assigning figure numbers that must change as figures are added or rearranged. LaTeX automatically assigns numbers to a paper's figures in order (automatically changing the numbers if you insert or remove a figure). To provide a stable way to refer to the figure, LaTeX lets the user assign an arbitrary tag to the figure (by inserting a `\label` command within the figure environment, e.g., `\label{reference-tag}`) and refer to that tag in the text (using the `\ref` command, e.g., `\ref{reference-tag}`). When LaTeX prints the paper, it finds the tag in its internal lists and substitutes the current figure number in the text. As an example, figure 1 in this paper displays the GGAO 12-m radio antenna. For this feature to work properly, the user should only create captions through the `\caption` command, which numbers the figures according to the internal list that will correspond to the tags. Please note that it will take at least two LaTeX runs to fully generate the list of references.

The `\label` and `\ref` commands may also be used for tables and sections.

Citations access bibliography entries in the same way. A tag is assigned to a bibliography entry by placing the `\bibitem` command (e.g., `\bibitem{citation-tag}`) within a bibliography entry. The tag is referenced within the paper's text with the `\cite` command (e.g., `\cite{citation-tag}`). As an example, as of the publication of the IVS 2000 Annual Report, the only established real-time VLBI correlation system is the KSP correlator in Japan [3].

Footnotes are created by the `\footnote` command. A footnote is used within this paragraph as an example. A wider selection¹ of tex examples (for footnotes and other features) is available on the IVS web page. (See section 3 for the address of the IVS web page.)

1.5. Special Symbols, Fonts and Accents

This section demonstrates how to make some special symbols, fonts and accents.

VLBI has been observed @ places such as Green Bank since the 1970s. Some other sites have been Onsala60, Wettzell & Tsukuba's 32-m antenna. Now VLBI is a part of IVS, a truly

¹There are 73 IVS 2000 Annual Report examples on the IVS web page.

international effort. (For example, a team of six from Europe and the US formed Team China #2 in April, 2000.) [And there are many other examples.] {The board of directors itself comprises people from many countries.}

IVS technology is impressive and continues to improve in efficiency, quality and cost-effectiveness. For example, the cost of recording media for the S3 VLBI data record/playback system is expected to be \$150 (US) per hour at a data rate of 1024 Mbit/sec (1 Gbit/sec) [10]. The high quality of IVS analysis leads to such useful measurements as that of secular polar motion (2.74 ± 0.01 mas/yr towards $83.9 \pm 0.3^\circ$ W longitude, when a low-pass filter is applied) ([2]). The ~40 IVS Network Stations, Operation Centers, Correlators and Data Centers also have *very* impressive accomplishments. Interested in more details? Then please read the IVS 2000 Annual Report!

The preferred way to place text in quotes for the General Meeting Proceedings is either ‘single quoting’ or “double quoting”. (Please note the different symbols used to start and end the quote.)

Some useful fonts are: **bold face**, *italics* and **typewriter**.

IVS has sites all over the world; therefore papers may need to use accents. Some examples of accents are: Ny-Ålesund, Hønefoss, the Centro de Rádio Astronomia e Aplicações Espaciais and the Bundesamt für Kartographie und Geodäsie located at Karl-Rothe-Straße 10–14.

One common error is writing the % sign without a preceding backslash. % without the backslash indicates a comment, which LaTeX will suppress in its output.

1.6. LaTeX-only and HTML-only Code (obsolete for GM2012)

As no HTML Web version of the Proceedings will be produced (but only a PDF online version), the use of HTML-only code for the 2012 Proceedings is not indicated.

2. Caveats

2.1. Caveats about Figures

Unlike previous General Meeting Proceedings, the 2012 version will not accept image files in (encapsulated) PostScript format. PostScript image files should be converted to PDF format first using the `pstopdf` or `ps2pdf` utilities. Other natively supported graphics formats are JPG and PNG.

2.2. Caveats about Fonts, Classes and Styles

Authors are requested to please refrain from changing the font sizes in their papers. The IVS Coordinating Center needs to make all papers look uniform in the paper publication.

The Coordinating Center only supports the `ivs2e` class file. The older `ivs` style file is not accepted anymore.

3. Other Resources

Examples of papers from previous Proceedings are available via ftp and the Web. The source tex and image files are available via anonymous ftp at `ivscc.gsfc.nasa.gov`. From there, cd to `pub/general-meeting/year`. The source files are in sub-directory `source`. Until 2006, the output html versions are available at `http://ivscc.gsfc.nasa.gov/publications/proceedings.html`. From

this page, click on any General Meeting Proceedings link (e.g., 2000 General Meeting).

Examples from IVS Annual Reports might also be useful. For the source tex and image files, use anonymous ftp to login to ivscc.gsfc.nasa.gov, sub-directory pub/annual-report/year/source. The output reports are available at sub-directories pub/annual-report/year/psgz and pdf. The output html versions are available at <http://ivscc.gsfc.nasa.gov/publications/annualreport.html>.

However, keep in mind that the 2012 Proceedings will be created with the `pdflatex` command. Hence, the direct support of PostScript graphics files is discontinued. On the other hand, special coding for the support of the HTML Web version is not needed anymore.

Comprehensive and in-depth LaTeX information and examples are available in the LaTeX User's Guide and Reference Manual [12] by Leslie Lamport.

Finally, please feel free to contact Karen Bayer at karen.d.bayer@nasa.gov if you need additional help or have needs that are not addressed by this sample file.

4. Acknowledgements

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